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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	H. OSAKA et al		
Serial No.:	10/517,591		
Filed:	December 13, 2004		
Title:	EQUALIZED AMPLITUDE SIGNALING DIRECTIONAL COUPLING BUS		
Group:	2111	Examiner: T. CLEARY	**CONF. NO. 1819**

APPELLANT'S BRIEF

Mail Stop: Patent Appeals (Fee) **June 23, 2008**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In response to the Final Office Action mailed August 20, 2007, the present Appellant's Brief is being submitted under 37 CFR §41.37, in connection with the appeal of the above-identified application. A Notice of Appeal was timely filed in this matter on January 22, 2008, together with a Petition for Extension of Time, and a further Petition for Extension of Time is being filed herewith along with the requisite fee for filing an Appellant's Brief.

I. REAL PARTY IN INTEREST

The real party in interest is Renesas Technology Corp. of Japan.

II. RELATED APPEALS AND INTERFERENCES

None

III. STATUS OF CLAIMS

Claims 1-18 have been cancelled and claims 19-22 are currently pending in the application. The pending claims 19-22 are included in Appendix A.

IV. STATUS OF AMENDMENTS

Following the filing of the Notice of Appeal on January 22, 2008, an Amendment After Final Rejection was filed on February 4, 2008. This amendment was entered by the Advisory Action dated February 19, 2008. The Advisory Action also removed the rejection of claims 20 and 22 under 35 U.S.C. §112. Appreciation is expressed to the Examiner for the entry of the amendment and removal of the 35 U.S.C. §112 rejection. The Advisory Action also indicated that the prior art rejection of claims 19-22 was being maintained. Further reasons for maintaining the rejection were provided on page 2 of the Advisory Action. Applicants response to these further reasons will be set forth in the arguments portion of this Appeal Brief.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present claims 19-22 are directed to the eighth embodiment of the invention shown, for example, in Figure 13 of the drawings. Like the other embodiments in the present application, the embodiment defined by the present claims is directed to high speed transfer of data between semiconductor circuits. In particular, the present invention is directed to the arrangement of directional couplers such as illustrated in 20-1, 20-2, 20-3 and 20-4 relative to one another and relative to a first wiring 20 from a first semiconductor circuit, such as the memory controller MC (identified with the numeral 1 in Figure 13). The directional couplers 20-1-20-4 are connected, respectively, to semiconductor devices (which can be, for example, DRAMs) 10-1 to 10-4.

As discussed in the background of the invention beginning on page 2 of the specification, Figure 2 shows a prior art signal transmission arrangement in which directional couplers 20-1 to 20-4 of equal length (e.g. L1-L4 all being the same length) have been utilized in the past. In particular, as noted on page 2, line 17 et seq:

> "In this example, directional couplers that are connected to the bus are identical in the configuration with each other, and the coupling coefficients (KB) and the coupling lengths L1 to L4 of those directional couplers are also constant."

Beginning with the second paragraph on page 3, the reasons for the constant lengths of the directional couplers and prior art systems are discussed. The second full paragraph on page 4 of the present specification notes that such prior art systems work well when data transfer rates are in the range of several

hundreds Mbps. However, as noted beginning with the last paragraph on page 4, Applicants have found that as the transfer speed increases, problems become exhibited with the prior art systems, including an increase in the amount of jitter attributable to the high speed. Therefore, the present invention is specifically directed to overcoming these problems in the prior art.

To this end, a number of embodiments of the present application are directed to increasing the length of the directional couplers 20-1 to 20-4 as the distance from the first semiconductor device (e.g. NC) increases. This suppresses jitters, as noted in the abstract of the present application. However, the eighth embodiment of Figure 13, claimed by the present invention, is directed to a completely opposite approach to resolving the problems of the prior art without the need for increasing the length of the couplers as distance along the main line 20 increases.

In particular, as can be appreciated from studying Figure 13 and the discussion found in the specification beginning on page 32, the eighth embodiment provides shorter coupling lengths as the distance increases from the first semiconductor device. In other words, as clearly shown in Figure 13, the coupling length L4 for the last directional coupler 20-4 is shorter than the coupling length of L1 for the first coupling device 20-1. On the other hand, the eighth embodiment also uses the technique of moving the directional couplers closer to the first wiring 20 as the distance of the directional couplers from the first semiconductor device increases. As such, as clearly shown in Figure 13, the distance W4 of the last directional coupler 20-4 is closer to the first wiring 20 than the distance W1 of the first directional coupler 20-1.

Pages 33 and 34 discuss the features of this completely different embodiment. As noted beginning four lines from the bottom of page 33:

> "Since the structure completely opposite from that in the first embodiment as made, the signal amount is reduced with a decrease in the coupling length L1, but this is compensated by increasing the coupling coefficient Kb. That is, since the coupling lengths L1 and the wiring intervals W1 are constituted as expressed in Expressions (14)) 15), regenerated cross talk signals have the comparable signal amplitude and the comparable signal time width. For that reason, it is possible to suppress an increase in jitters and the delay time jitters of the receivers, which are attributable to the wiring. For that reason, the structure is suitable for data propagation of further ultrahigh speed as compared with that in the first embodiment"

Turning to the independent claim 19, a comparison will now be provided as required under 37 C.F.R. §41.37. As noted above, the present independent claim 19 and its dependent claims 20-22 are particularly directed to the embodiment shown in Figure 13.

The preamble for claim 19 defines "a bus system adapted to transfer data between a plurality of semiconductor devices." Referring to Figure 13, and the discussion found on pages 32-34, a bus system is provided for data transfer between semiconductor devices labeled with the numerals 1 and 10-1 to 10-4.

In the body of claim 19, the first paragraph defines "a first wiring extending in a first direction from a first semiconductor device." This can be read on the first wiring 20 extending in a first direction from the first semiconductor device MC (1). The first line corresponds to the main line "main line 20" discussed on line 13 of page 33 regarding Figure 13. The first semiconductor device corresponds to NC1 discussed on page 33, line 9, for example.

The second paragraph of the body of claim 19 calls for "n-coupling wirings forming directional couplers extending in sequence away from first said

semiconductor device in said first direction, each of said directional couplers being parallel to said first wiring." This corresponds to the directional couplers 20-1 to 20-4 extending in sequence away from the first semiconductor device MC, as shown in Figure 13. This is discussed, for example, on page 33, lines 1-3.

The third paragraph of the body of claim 19 defines "n semiconductor devices, different from the first semiconductor device, each respectively connected to a corresponding one of said directional couplers."
This corresponds to the semiconductor devices 10-1 to 10-4 of Figure 13 although the semiconductor devices 10-1 to 10-4 are not directly discussed on pages 32-34 regarding Figure 13, the last full paragraph of claim 32 notes:

> "The structure is substantially identical with that in the first embodiment, but different in the structure of the directional couplers therefrom."

Referring to the discussion of the first embodiment, shown in Figure 1, page 15 identifies the elements 10-1 to 10-4 as semiconductor circuit such as DRAMs (e.g. see page 15, lines 4 and 5).

The fourth paragraph of the body of claim 19 defines:

> "Wherein each of the directional couplers have a predetermined coupling length and a predetermined wiring interval of spacing from the first wiring."

This corresponds to the arrangement shown in Figure 13 in which the directional coupler 20-1 to 20-4 each have a respective coupling length L and a wiring interval of spacing W relative to the first wiring 20. This, of course, is discussed beginning with the last line of page 32 through page 34, line 10.

The next paragraph of independent claim 19 defines:

> "Wherein the coupling length of the directional couplers decrease as the respective distance of the directional couplers from the first semiconductor device increases."

As discussed above, this is clearly shown with the decreasing length of the directional couplers from the longest length of L1 for the first directional coupler 20-1 to the shortest length L4 for the directional coupler 20-4 farthest from the first semiconductor device MC. This is also clearly shown in the expression (15) on page 33 regarding Figure 13.

The final paragraph of independent claim 19 defines:

> "Wherein the wiring intervals of spacing of the directional couplers from the first wiring decrease as the respective distances of the directional couplers from the first semiconductor device increase."

This corresponds to the decrease in wiring intervals from the greatest spacing W1 of the directional coupler 20-1 closest to the first semiconductor circuit MC to the shortest spacing W4 for the directional coupler 20-4 farthest from the first semiconductor circuit MC. This is also described an expression (14) found on page 33 regarding Figure 13.

Dependent claims 20-22 each define specific features of the invention which further distinguish over the cited prior art, as will be discussed hereinafter.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Independent claim 19 and its dependent claims 20-22 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Japanese Patent No. JP 2001-27987 to Osaka, et al., as translated by U.S. Patent No. 6,654,270 to Osaka, et al., (hereinafter "Osaka"), which claims priority to the above noted Japanese patent, in combination with U.S. Patent No. 7,126,437 to Simon, et al., (Simone-437).

Independent claim 19 has also been rejected under 35 U.S.C. §103(a) as unpatentable over Simon-437 in view of U.S. Patent No. 6,625,682 to Simon et al., (hereinafter Simon-682).

As noted above, the 35 U.S.C. §112, second paragraph, rejection of claims 20 and 22 set forth on page 2 of the Final Office Action has been removed in light of the entry of the amendment filed on February 4, 2008.

VII. ARGUMENTS

A. The 35 U.S.C. §103(a) rejection of independent claim 19 as being unpatentable over Osaka in view of Simon-437.

At the outset, it is noted that the independent claim 19 of the present application specifically defines:

> "Wherein the coupling lengths of the directional couplers decrease as the respective distance of the directional couplers from the first semiconductor device increases."

As noted above, this is a particular distinction of the eighth embodiment of the present invention, which, as noted beginning four lines from the bottom of page 33 of the present application, is completely opposite from the first embodiment of the present application. It is also respectfully submitted that this decreasing of coupling lengths is completely opposite anything taught by the primary reference to Osaka, in whether considered alone or combination with Simon-437.

In the Final Office Action, Fig. 1 of the Osaka reference is relied on to meet this feature. Specifically, the Office Action states in paragraph 7 on page 3 that Osaka teaches this feature due to the illustration of directional couplers identified with the numbers C2 and C3 in Fig. 1. Indeed, in Fig. 1, the line C3 is shorter than the line C2. However, it is respectfully submitted that this illustration in Fig. 1 of Osaka is simply a matter of drawing simplification, and not an indication of the actual structure being taught.

With regard to this, it is first noted that there is absolutely no discussion in the specification of Osaka of the coupler C2 being longer than the coupler C3. Quite to the contrary, Fig. 2 of Osaka clearly shows that the coupling links of C2 and C3 is identical. As such, in light of the fact that the specification is completely silent with

regard to any differing for the couplers C2 and C3 and inasmuch as the drawings of Fig. 1 and 2 are clearly inconsistent with one another regarding the lengths, it is respectfully submitted that there is no basis for assuming that Fig. 1 is correct while Fig. 2 is incorrect. Quite to the contrary, because of the particular nature of Fig. 1, if it were accurately drawn to show an identical length (which can be accomplished in Fig. 2), the wirings of the directional couplers C2 and C3 would have overlapped each other, making the drawing difficult to understand. To put this another way, the fact that C3 is shown shorter than C2 in Fig. 1 is merely a matter of drawing simplification due to the simplified nature of Fig. 1. Fig. 2 is an actual illustration of a board arrangement of the first embodiment (e.g., see column 3, lines 40 and 41) and, as such, certainly a more accurate representation of actual structure. Fig. 1 is simply described in column 3, line 39, as "a view for explaining a first embodiment." Therefore, clearly, Fig. 2 is a more accurate representation of the actual intended structure for the coupling length.

With regard to this matter, reference is made to the case of *In Re Wilson,136 USPQ 188* which notes that "patent drawings are not working drawings." More specifically, in that case, the CCPA stated:

> "Both the Patent Office and Appellants have engaged in what appears to us to be a somewhat futile attempt to measure the thickness of Weisse coil strip and the Weisse lap spacing in their respective attempts to show whether the particular lap spacing recitations included in the claims now before us are or are not distinguishable from those disclosed by Weisse. Appellants, for example, conclude in typically precise fashion that the Weisse lap spacing is "about 30% - 60% greater than applicants top spacing."

"Patent drawings are not working drawings and this argument is predicated, moreover, on a greatly enlarged section of a small drawing obviously never intended to show the dimensions of anything." 136 USPQ at 192.

It is respectfully submitted that Fig. 1 of Osaka was also clearly "never intended to show the dimensions of anything." It is merely a view for a general illustration. In addition, it is clearly contrary to what one would expect to be a more accurate representation of actual dimensions, that is, Fig. 2 which is a "board arrangement of the first embodiment" and which clearly shows that C2 and C3 have the same length. And, once again, it should be borne in mind that the specification is completely silent on any difference in length between the two couplers.

In the case of *In Re The Successor in Interest to Walter Anderson, 223 USPQ 378,* the CAFC followed the CCPA decision of Wilson. In that case, the CAFC stated:

> "The only support for the appellants position is found in one of the drawings in Winder. The appellant argues that a certain label on the drawings belies the boards interpretation of Winders timing sequence or, at least, renders Winder ambiguous as to its timing. We reject this argument. The reference drawing is merely a *simplified* schematic intended to provide a summary overview of Winders timing sequence. The timing ambiguity in this simplified drawing does not outweigh the consistent and unambiguous detailed teachings of the specification in mechanical drawings of the Winder patent." *223 USPQ at 380*.

Again, this corresponds to the present situation in which the simplified view in Fig. 1 is contrary to the more detailed illustration of Fig. 2 of Osaka, and also at odds with the specification, which does not discuss dimensions at all.

As a further point in this matter, it is noted that, in column 4, line 41 of the Osaka U.S. Patent, the statement is made that "the directional couplers are equivalent to ones of USP 5,638,402." In that referenced USP, it is noted that the coupling portions are referred to as having a constant length L. As such, one constructing the directional couplers in accordance with Osaka's directions in column 4, line 40 et seq., by referring to USP 5,638,402, would utilize coupling portions having a constant length L. Again, this would correspond to the more detailed

illustration of Fig. 2 of Osaka. As such, it is urged that this serves as even further evidence that the illustration of different drawing length in Fig. 1 of Osaka is merely a point of drawing simplification, and clearly at odds with the more specific teachings of both Fig. 2 and the reference, in column 4, line 41 of the Osaka patent, to a USP using a constant length for coupling portions.

For the reasons set forth above, it is respectfully submitted that this important limitation of independent claim 19 is completely lacking from any of the cited references. As noted above, the relied on Fig. 1 of Osaka clearly is just a simplified drawing which does not teach or suggest this important limitation of Claim 19.

Accordingly, for the reasons set forth above, it is respectfully submitted that the primary reference to Osaka clearly lacks the feature of the claimed invention, defined in claim 19, that the coupling lengths of the directional couplers decrease as the respective distance of the directional couplers from the first semiconductor device increases. However, in the Advisory Action, it is argued that the rejection is not based only on Osaka, but on a combination of Osaka and Simon. More specifically, the Advisory Action states:

> "Simon discloses that it is well known in the art to use deliberately non-uniform coupling strengths in order to maintain equal signal strengths by providing for increased coupling as distance from the source increases (see column 1, line 54-column 2, line 12). Simone further discloses that there are a variety of methods of increasing the coupling strength including varying the length of the coupler and varying the space of the coupler (see column 2, lines 14-39 and column 3, lines 17-28). Thus, one of ordinary skill in the art would recognize that Simon anticipates all of the methods of increasing coupling strength, including decreasing the coupling lengths while decreasing the spacing as the distance from the source increases."

It is Applicants understanding that the reference to "Simon" in the Advisory Action is referring to "Simon-437" since the portions discussed in the Advisory Action appear to correspond to the referred to columns and lines of Simon-437.

In response to this arguments set forth in the Advisory Action, although Applicants recognize the general statements made in Simon-437 regarding increasing coupling strengths, it is respectfully submitted that there is absolutely no suggestion at all in Simonj-437 for decreasing the coupling lengths of the couplers as the distance from the first semiconductor device increases. This claimed arrangement for decreasing coupling lengths as the distance from sources increases goes completely contrary to all teachings in the prior art, including Simon-437, which either provide for constant coupling lengths or increasing coupling lengths as the distance from the first semiconductor devices increases. Only Applicants have proposed the decrease of coupling lengths, offset by the decrease in spacing to obtain the desired reduction in jitters without the need for increasing the size of the coupling lengths. In other words, the present invention permits the same advantages achieved by the prior art devices, including Simon-437, while actually being able to decrease the coupling length of the devices further away from the first semiconductor device, thereby permitting an overall decrease in the size of the overall data transfer arrangement.

While Simon-437 makes general statements concerning increasing coupling strength, as recognized by the arguments in the Advisory Action, it is urged that there is nothing whatsoever in Simon-437 or any of the other cited prior art, which would actually lead one to consider a decrease in the size of the coupling lengths with increasing distance. The embodiment shown of Simon-437 shows the exact opposite, that is, increasing coupling length. The embodiment shown in Figure 6

shows constant coupling length, with different trace widths at the different coupling locations along the bus (as discussed in column 3, line 29 et seq.). In no case is a decrease in coupling length taught or suggested either in the specific embodiments of Simon-437 or the specification of Simon-437.

With regard to the present matter, reference is made to MPEP 2143.01 under the heading "VI The proposed Modification Cannot Change the principle of Operation of a Reference." In this section, reference is made to the case of In re Ratti, 270 F.2d 810 (CCPA 1959) which reversed a rejection based on the holding that:

> "Suggested combination of references would require a substantial reconstruction and redesign of elements shown in [the primary reference] as well as a change in the basic principal under which the [primary reference] construction was designed to operation."

As discussed above, both the Osaka reference and the Simon-437 reference are based on principles of operation utilizing either constant coupling lengths or increasing coupling length. The proposed modification to use decreasing coupling lengths, to meet the present claims, is a "substantial reconstruction and redesign of the elements" taught by both the primary reference to Osaka and the secondary reference to Simon-437. Therefore, it is urged that this proposed reconstruction, set forth in the rejection, is based solely on hindsight of the Applicants claimed invention and the disclosures of Figure 13 of the present application. Therefore, reversal of this basis of rejection of independent claim 19 is earnestly solicited.

B. The 35 U.S.C. §103(a) rejection of independent claim 19 over Simon-437 in view of Simon-682

The shortcomings of the Simon-437 reference in terms of meeting the limitations of claim 19 concerning the decrease in coupling lengths with increasing distance from the first semiconductor device are discussed in length above. On page 5 of the Final Office Action, it is stated that Simon-682 "discloses using shorter electromagnetic couplers (see column 6, lines 14-18)." Appellants respectfully submit that the discussion found in column 6, lines 14-18 of Simon-682 would not make it obvious to modify Simon-437 to arrive at the invention defined in claim 19, for the reasons discussed below.

Specifically, Simon-682 discloses in column 6, lines 14-18 that:

> "Both the energy transferred by an electromagnetic coupler and the maximum effective signaling frequency supporting by a system that employs electromagnetic couplers depends on the coupling length. In addition, longer couplers take more space and entail larger system costs."

As such, Simon-682 recognizes the general relationship between energy transfer and coupler length, and the obvious fact that longer couplers take more space and cost more. However, once again, there is absolutely no suggestion in Simon-682 for going completely contrary to prior art teachings by decreasing coupling length with increasing distance from the first semiconductor device. In other words, as noted above, the prior art devices including Osaka and Simon-437 clearly are directed only to constant coupling lengths or increasing coupling lengths with distance to increase coupling strength. Nothing in the general statement in Simon-682 would suggest when one utilize shorter coupling lengths with increase in distance from the first semiconductor device. Indeed, if this were

so obvious, one would expect a direct statement in Simone 682 or an illustrated embodiment of such an arrangement. No such discussion or arrangement is found. Therefore, it is urged that Simon-682 does not add anything to make up for the above noted upcomings of Simon-437 (or Osaka, for that matter) regarding the claimed relationship of decreasing the coupling length with increasing distance from a first semiconductor device. Therefore, reversal of the rejection of claim 19 is unpatentable over Simon-437 in view of Simon-682 is also respectfully requested.

C. **The 35 U.S.C. §103(a) rejection of dependent claims 20-22 over Osaka in view of Simon-437.**

The dependent claims 20-22 specifically define features of the invention that the first semiconductor device is a memory controller and the n semiconductor devices are DRAMs. It is respectfully requested that these claims 20-22 be considered as a group, and that they be separately considered from the features of the parent claim 19. In particular, these claims define a specific environment, as shown in the embodiment of Figure 13, of the relationship between a memory controller (such as MC in Figure 13) and the individual DRAMs 10-1 through 10-4. The dependent claims 20-22 when considered with the features of the parent independent claim 19, define a specific arrangement for operation of DRAMs in conjunction with a memory controller in which the directional couplers arrange between the respective DRAMs and the main wiring line 20 can be arranged to decrease in size, completely contrary to prior arrangements for such DRAMs and memory controllers. In particular, Figure 2 of the present drawings shows a conventional arrangement of DRAMs 10-4-10-4 and a memory controller MC utilizing constant coupling length L1-L4 and

constant spacing between the directional couplers 20-1 to 20-4 and the main line 20. As such, the invention defined dependent claims 20-22 represents a significant improvement in systems combining memory controllers, DRAMs and directional couplers for data transmission, and clearly define over the cited prior art to Osaka and Simon-437. In particular, as noted at length above regarding the Osaka reference, this reference simply teaches the prior art arrangement shown in Figure 2 of the present application for systems utilizing memory chips and a memory controller. Simon-437 as noted at length above, clearly only teaches only constant lengths, like Osaka, or increasing lengths. Nowhere is there any suggestion of the combination of the directional couplers for individuals DRAMs increasing in couplings lengths as the distance from a memory controller along a main wiring line 20 increases. Therefore, separate consideration and allowance of the dependent claims 20-22 is earnestly solicited.

Incidentally, it is noted that claims 20-22 have not been rejected over the combination of Simon '437 and Simon '682, and, as such, it is applicants' understanding that these claims will be allowed if the rejection of these claims over Osaka in view of Simon '437 is reversed.

VII. CONCLUSION

For the foregoing reasons, appellants request that the Examiner's rejections be reversed.

The Appeal Brief filing fee of $510.00 is being effected by electronic payment.

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of either by telephone discussion or by personal interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Antonelli, Terry, Stout & Kraus, LLP Deposit Account No. 01-2135 (Docket No. 520.44478X00), and please credit any excess fees to such deposit account.

Respectfully submitted,
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Enclosures: Appendix A (Claims)
Appendix B (Evidence Appendix)
Appendix C (Related Proceedings Appendix)

APPENDIX A

CURRENT CLAIMS

19. A bus system adapted to transfer data between a plurality of semiconductor devices, comprising:

a first wiring extending in a first direction from a first semiconductor device;

n-coupling wirings forming directional couplers extending in sequence away from said first semiconductor device in said first direction, each of said directional couplers being parallel to said first wiring; and

n semiconductor devices, different from the first semiconductor device, each respectively connected to a corresponding one of said directional couplers,

wherein each of the directional couplers has a predetermined coupling length and a predetermined wiring interval of spacing from the first wiring,

wherein the coupling lengths of the directional couplers decrease as the respective distance of the directional couplers from the first semiconductor device increases, and

wherein the wiring intervals of spacing of the directional couplers from the first wiring decrease as the respective distances of the directional couplers from the first semiconductor device increase.

20. A bus system according to claim 19, wherein the first semiconductor device is a memory controller.

21. A bus system according to claim 19, wherein the n semiconductor devices are DRAMS.

22. A bus system according to claim 20, wherein the n semiconductor devices are DRAMS.

APPENDIX B

EVIDENCE APPENDIX

EVIDENCE APPENDIX

None.

APPENDIX C

RELATED PROCEEDINGS APPENDIX

RELATED PROCEEDINGS

None.